PROPOSED CHANGES TO HUMAN HEALTH RISK ASSESSMENT METHODOLOGY FOR INSTALLATION RESTORATION SITE 12
NAVAL STATION TREASURE ISLAND, SAN FRANCISCO, CALIFORNIA

Issue No.	HHRA Step	RI Work Plan (SulTech 2006) Methodology	Proposed Change to Methodology	Justification for Proposed Change
1	Risk Calculation Methodology	Calculate risks using the "forward calculation" methodology, consistent with EPA (1989) RAGS Part A. Risk calculations are typically presented in the EPA (2001) RAGS Part D table format.	Develop site- and receptor-specific RBCs using the exposure assumptions and toxicity criteria hierarchy outlined in the RI Work Plan (SulTech 2006). Use the RBCs and a ratiometric approach (consistent with the approach outlined in the EPA [2008] RSL user guide) to calculate risks for each EU and receptor. Use a simplified table format for presentation of the ratiometric risk calculations. Present pathway-specific, medium-specific, and cumulative risks.	Risk calculations are needed for multiple EUs. Receptors that will be evaluated are the same for EU. Many of the EUs have similar COPCs. The RBC-ratiometric approach is a streamlined risk calculation approach that is useful for sites with multiple exposure units and receptors. The RBCs can be calculated concurrently with the calculation of EPCs and the ambient evaluation. The ratiometric approach will allow risks to be estimated quickly once EPCs are developed. The RBC-ratiometric approach allows risk estimates to be quickly updated, if data sets change for one or more EUs. Risks calculated using the RBC-ratiometric approach are the same as those calculated using the forward calculation methodology. The RAGS Part D table format involves multiple tables for a single EU and receptor; much of the information presented among the tables is redundant. The RBCs will be site- and receptor-specific, and will incorporate the exposure and toxicity assessment approach outlined in the RI Work Plan for Site 12 (SulTech 2006).

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2	Central Tendency Exposure Risk Estimates	Prepare CTE risk estimates in addition to RME risk estimates.	Eliminate CTE risk estimates from the HHRA.	CTE risk estimates are not discussed in the risk characterization and have not been used for risk management decisions at TI or other Navy installations. *Option:* Proceed with proposed change, but include a semi-quantitative evaluation in the uncertainty analysis that quantifies the differences in intakes by exposure route between CTE and RME assumptions. This information can be used to semi-quantitatively extrapolate the relative differences between CTE and RME risk estimates.
3	Inhalation of Volatile Chemicals Released from Soil to Outdoor Air	Exclude inhalation of volatile chemicals in soil that are released to outdoor air as a complete exposure pathway.	Include this exposure pathway for quantitative evaluation in the HHRA for EUs where volatile chemicals are detected in soil.	This exposure pathway is potentially complete and can be significant for some volatile chemicals. Volatile chemicals may not be detected in soils at some EUs – for those EUs, the pathway is incomplete and does not require evaluation.
4	Site Risk, Ambient Risk, and Total Risk	Site Risk: Calculate for chemicals identified as COPCs; excludes metals that do not exceed ambient concentrations. Ambient Risk: Calculate for metals excluded from the Site Risk calculation. Ambient concentrations are used to derive EPCs. Total Risk: Combine estimates of Site Risk with estimates of Ambient Risk.	Total Risk: Include all metals (except essential nutrients), regardless of ambient concentrations. Ambient Risk: Calculate for all metals for which ambient data are available. Use ambient concentrations to derive EPCs. Incremental Risk: Subtract the Ambient Risk from the Total Risk. For metals that do not exceed ambient concentrations, assume the EPC is zero. For metals that exceed ambient concentrations, subtract the ambient EPC from the site EPC to drive the incremental EPC.	For metals, the Incremental Risk more accurately represents the risk associated with site-related activities. Specifically, for metals that exceed ambient concentrations, the portion of the measured concentration associated with ambient levels is excluded from risk estimates.

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5	Groundwater Exposure Points	Establish groundwater plumes based on delineation of groundwater data to nondetected concentrations. Evaluate risks separately for each groundwater plume; that is, treat each plume as a separate exposure point. Evaluate monitoring wells not associated with the delineated plumes as discrete exposure points.	Except for the Building 1311/1313 Petroleum Area, evaluate groundwater on a site-wide basis (combine groundwater data across all EUs). A petroleum-based plume is associated with groundwater at the Building 1311/1313 area. An arsenic-based plume is associated with the Mariner Drive area. Evaluate groundwater as a separate exposure points for these areas. If groundwater chemicals of concern are identified for the site-wide evaluation, further evaluation on an EU or area-specific basis may be necessary.	Groundwater plumes have not been demonstrated at Site 12, based on historical or current data. Potential exposure to groundwater from direct contact is limited to the construction worker scenario. Indirect exposure to groundwater from vapor intrusion will be evaluated using active soil gas data.
6	Vapor Intrusion Exposure Points	Evaluate vapor intrusion risks for existing and hypothetical buildings; evaluate each building as a separate exposure point.	Evaluate vapor intrusion risks on an EU-specific basis using the maximum detected soil gas concentration as the source concentration for each EU. If chemicals of concern are identified, further evaluation on a building-specific basis may be necessary.	Comparison of the soil gas results to project action levels in the sampling plan shows that soil gas concentrations are relatively low. Initial evaluation using a maximum concentration, worst-case scenario approach that will save time.
7	Inhalation Exposure Estimates	Estimate inhalation exposure using the EPA (1989) RAGS Part A methodology, which involves (1) using inhalation rate and body weight to estimate chemical dose and (2) converting inhalation unit risks and reference concentrations to inhalation cancer slope factors and references doses.	Evaluate inhalation exposure using the EPA (2009) RAGS Part F methodology, which involves estimating inhalation dose by adjusting for less-than-continuous exposure.	The inhalation methodology outlined in the RI work plan is outdated and has been superseded by the EPA (2009) RAGS Part F methodology.

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8	TEFs for Dioxin and Dioxin-Like Compounds	Use TEFs provided in Van den Berg and others (2001).	Use TEFs provided in Van den Berg and others (2006).	TEFs have been updated since completion of the RI work plan.
9	Vapor Intrusion Evaluation	Use soil and groundwater data as source concentrations to estimate indoor air concentrations from subsurface vapor intrusion.	Use active soil gas results as source concentrations, rather than soil and groundwater concentrations.	Active soil gas data were specifically collected for Site 12 to evaluate the vapor intrusion exposure pathway.
10	Exposure Point Concentrations	Develop 95UCLs and EPCs consistent with recommendations of ProUCL Version 3 (EPA 2004).	Develop 95UCLs and EPCs consistent with recommendations of ProUCL Version 4 (EPA 2007a, 2007b).	The EPA 95UCL and EPC methodology has been updated since completion of the RI work plan.
11	Chemical of Potential Concern (COPC) Selection	Select COPCs and calculate risks using two different methods: Method 1 – Include as COPCs all detected chemicals except those that are essential nutrients, are detected infrequently, do not exceed ambient concentrations, and do not exceed RBCs (such as EPA RSLs). Risk calculations for Method 1 COPCs are based on Federal (EPA) toxicity criteria. Method 2 – Include as COPCs all detected chemicals except those that are essential nutrients and that do not exceed ambient concentrations. RBC screening is not used for Method 2. Risk calculations for Method 2 COPCs are based on State (DTSC) toxicity criteria as the primary source of toxicity criteria.	Select COPCs and calculate risks using a modified Method 1 approach – Include all detected chemicals as COPCs except those that are essential nutrients (Ca, Mg, K, and Na). Do not use RBC screening to identify COPCs. Calculate risks for COPCs using Federal (EPA) toxicity criteria. (See Issue 5 for discussion of ambient evaluation.) Acknowledge in the HHRA that State toxicity criteria differ from Federal criteria, and that the difference is significant for some chemicals. For up to 10 chemicals, provide a semi-quantitative discussion in the HHRA of the differences in risk estimates that would result of State toxicity criteria were used. Request DTSC input on the chemicals to address in this discussion.	COCs requiring remedial goals and remedial action objectives for other TI sites are based on Method 1 risk results, which incorporate Federal toxicity criteria. Risk communication is facilitated when risk estimates are based on a single method. For most chemicals, State toxicity criteria are relatively similar to Federal criteria. In most cases, it is likely EUs for which risks exceed the point of departure based on Federal criteria would also exceed the point of departure based on State criteria. The HHRA will address those small subset of chemicals for which State toxicity criteria significantly differ from Federal criteria.

Other Items

1) Redevelopment Plan for TI and Areas Planned for Open Space Reuse

    a. The RI Work Plan (SulTech 2006) does not address potential health risks for future recreational users.
    b. The Navy proposes to quantify health risks for recreational exposures in the HHRA.
        i. Exposure to surface soil (0 to 2 feet bgs) and subsurface soil (0 to 10 feet bgs) will be evaluated for each EU.
        ii. Proposed assumptions for recreational exposure to soil are shown in Attachment 1.

2) SWDAs will not be included in the RI/HHRA, but will be addressed in the RACR. The RI Work Plan indicates that the SWDAs will be evaluated in the HHRA.

3) Risks for the Bigelow Ct. SWDA will not be calculated in the HHRA because it is included in the SWDA EE/CA and Action Memo, and removal actions for this SWDA could take place at any time.

Notes

95UCL	95 percent upper confidence limit	HHRA	Human health risk assessment
bgs	Below ground surface	RACR	Remedial action completion report
COC	Chemical of concern	RAGS	Risk assessment guidance for Superfund
COPC	Chemical of potential concern	RBC	Risk-based concentration
CTE	Central tendency exposure	RI	Remedial investigation
DTSC	Department of Toxic Substances Control	RME	Reasonable maximum exposure
EE/CA	Engineering evaluation / cost analysis	RSL	Regional screening level
EPA	U.S. Environmental Protection Agency	SWDA	Solid waste disposal area
EPC	Exposure point concentration	TEF	Toxicity equivalency factor
EU	Exposure unit	TI	Treasure Island

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